

INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 2005	Park: Shenandoah NP						
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Permit#: SHEN-2002-SCI-0019							
Park-assigned Study Id. #: SHEN-00280							
Project Title: ACIDIC DEPOSITION IMPACTS ON NATURAL RESOURCES IN SHENANDOAH NATIONAL PARK (Cooperative Agreement 4000-7-9002)							
Permit Start Date: Jun 01, 2002	Permit Expiration Date Jun 01, 2005						
Study Start Date: Jun 01, 2002	Study End Date Jun 30, 2006						
Study Status: Continuing							
Activity Type: Research							
Subject/Discipline: Fish / Ichthyology							
Objectives: To determine the viability of selected Park fish species in acidified streams using carefully controlled caged transplants.							
Findings and Status: <p>Stream acidification due to increased anthropogenic emissions of sulfur and nitrogen has resulted in the decline of fisheries in many regions. Headwater streams are particularly vulnerable to acidification, as they exhibit a catchment scale response to atmospheric deposition. Virginia hosts 450+ native brook trout streams, 46 of which are located in Shenandoah National Park (SNP). In response to a declining trend in ANC for 60 of Virginia's native brook trout streams sampled quarterly by the Virginia Trout Stream Sensitivity Study, the Shenandoah National Park: Fish in Sensitive Habitats (SNP:FISH) project was conducted from 1992-1995. The acid sensitivity of two species were examined: Brook trout and blacknose dace. It was determined that fish species richness in SNP is closely linked to stream chemistry.</p> <p>This study extended the SNP:FISH project to evaluate the acid sensitivity of five species (blacknose dace, longnose dace, mottled sculpin, mountain redbelly dace, and rosyside dace) in SNP using in situ bioassays. Bioassays were conducted in Meadow Run (acidic treatment stream) and the Rapidan River (non-acidic control stream). The bioassays were repeated twice during two different time periods (10/24/03-11/16/03 and 11/22/03-12/15/03). An analysis of stream chemistry during the two periods shows that the stream chemistry was more acidic in the treatment stream (Meadow Run) during the second bioassay time period (mean pH=5.17) than the first (mean pH=5.32).</p>							

Mortality was not observed for any species during the first bioassay time period in either stream, although a statistical analysis suggests sublethal stress occurred for longnose dace and rosyside dace in Meadow Run. Mortality was observed during the second bioassay time period in Meadow Run for all species except mottled sculpin, which may have experienced sublethal stress in that stream. No mortality was observed during either bioassay time period in the Rapidan River.

Fish can exhibit two types of response to stream chemistry that lead to mortality. In an acute response, fish die when chemical conditions reach a certain threshold level. In a cumulative dose response, fish die due to chronic exposure to low pH or high Al³⁺ over time (accumulation of H⁺ or Al³⁺ on the gill epithelium over time). This study suggests a cumulative dose mortality response in which fish begin to die when the total Al³⁺ exposure reaches 900 ug/L in less than 15 days (stream Al³⁺ concentrations > 60 ug/L per day for 15 days). Differential fish mortality was observed across the five species used in this study. From most to least sensitive, the relative ranking of the five species is as follows: Longnose dace, mountain redbelly dace, blacknose dace, rosyside dace, and mottled sculpin.

All research is complete for this project. The final report is being prepared for submission and review. The first draft of the report is 80% complete and has been reviewed by SHEN staff. A no-cost extension has been granted by NPS until June 30, 2006 to complete the final report.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

No

Funding provided this reporting year by NPS:

0

Funding provided this reporting year by other sources:

0

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:

University of Virginia

Annual funding provided by NPS to university or college this reporting year:

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